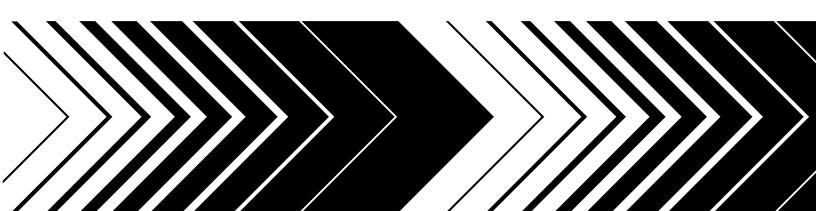**&EPA**

US EPA Office of Research and Development

Human Health Metrics for Environmental Decision Support Tools:

Lessons from Health Economics and Decision Analysis

HUMAN HEALTH METRICS FOR ENVIRONMENTAL DECISION SUPPORT TOOLS:

LESSONS FROM HEALTH ECONOMICS AND DECISION ANALYSIS

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Notice

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Foreword

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E. Timothy Oppelt, Director
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Abstract

Environmental decision support tools often provide information that predicts a multitude of different human health effects due to environmental stressors. Medical decision making and health economics offer many metrics that allow aggregation of these different health outcomes. This paper provides a review of this literature with special attention to aspects relevant in the environmental context. Based on a characterization of medical and environmental applications, recommendations for the use of human health metrics in different environmental decision support tools have been derived. Further, three metrics (quality adjusted life years (QALYs), disability adjusted life years (DALYs) and willingness-to-pay (WTP)) have been used to compare a wide range of different environmental risk factors. In this example, WTP tends to reflect mortality outcomes only. QALYs and DALYs are sensitive to mild illnesses that affect large numbers of people, which are difficult to assess in an unbiased manner. Since health metrics tend to follow the paradigm of utility maximization, these metrics may be supplemented with a semi-quantitative discussion of distributional and ethical aspects. Finally, the magnitude of age-dependent disutility due to mortality for both monetary and non-monetary metrics may bear the largest practical relevance out of a series of suggested research questions.

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Acronyms and Abbreviations

$	U.S. Dollar
15D	quality of life measurement instrument using 15 attributes (or dimensions)
BCA	Benefit Cost Analysis (same as CBA)
CA	Conjoint Analysis
CBA	Cost-Benefit Analysis (same as BCA)
CEA	Cost-Effectiveness Analysis
COI	Cost of Illness
CUA	Cost-Utility Analysis
CV	Contingent Valuation
CVA	Cost-Value Analysis
DALYs	disability adjusted life years
DC	Dichotomous choice format
EPA	Environmental Protection Agency (same as USEPA or U.S. EPA)
EUR	European currency prior to the introduction of the Euro
EuroQol	European Quality of Life measurement instrument
GDP	Gross Domestic Product
HALYs	health adjusted life years
HALYs+	Health Adjusted Life Years with age-weighting
HUI	Health Utility Index
HYE	Health-Years Equivalent
ISO	International Standard Organisation
ME	Magnitude Estimation
O3	(tropospheric) Ozone
OE	Open-ended question format
PM10	Particulate Matter smaller than 10µm
PTO	Person Trade-Off
QALYs	quality adjusted life years
Qm	chronic health state
QW	Quality Weight
QWB	Quality of Well-Being
r	risk aversion factor
SEYLL	standard expected years of life lost
SF36	short form with 36 questions/attributes
SG	Standard Gamble
t	time
TO	Tradeoff Method
TTO	Time Trade-Off
U.S. EPA	United States Environmental Protection Agency
UN	United Nations
USEPA	United States Environmental Protection Agency
UV-A/B	Ultraviolet radiation within spectrums A or B
VAS	Visual Analogue Scale
VSL	Value of a Statistical Live
WHO	World Health Organisation
WTA	Willingness to Accept
WTP	Willingness-to-Pay
YLD	Years Lived Disabled
YLL	Years of Life Lost

Acknowledgements